



**Question #1: Mathematics – Math Concepts**

*10 points*

The **Lissajous** [**lees-ah-zhoo**] curve with a phase shift of one-fourth pi and a frequency ratio of two is one of these shapes. This shape is generated by the polar equation  $r$  equals one divided by the quantity one plus cosine theta. Rays that are parallel before reflecting off one of these shapes will converge to a point. This shape is the locus of all points the same distance from a fixed line, called a directrix, and a fixed point, called a focus. The graph of a quadratic function is this kind of shape. Name this shape generated by the equation  $y$  equals  $x$  squared.

**parabolas** [prompt on **conic** sections or **conics**]

**Question #2: Literature – British Literature**

*10 points*

This character was invited to “crush a cup of wine” by an illiterate servant after he read aloud a guest list. This character was called a “beautiful tyrant” and “fiend angelical” by his love interest after he asks “What light through yonder window breaks?”. He paid an apothecary 40 **ducats** [**DUK-uts**] for a lethal drug. Prince Escalus banished this character following his murder of **Tybalt** [**TIB-alt**]. Name this “star-crossed lover” of the Montague family, whose poison consumption leads Juliet to stab herself in a Shakespeare play.

**Romeo** Montague [prompt on **Montague** before it is mentioned]



### Question #3: Science – Earth Science

10 points

<p>A recent study of these objects at El <b>Tatio</b> [TAH-tee-oh], including El <b>Jefe</b> [HEH-fay], in Chile, emphasized the importance of underground bends and loops in their structures. These formations name a type of opal silica also known as <b>siliceous</b> [sih-LIH-see-us] sinter. These formations are similar to the <b>fumaroles</b> [FYOO-muh-“roles”] located on sides of volcanoes. A valley of these objects is on Kamchatka Peninsula, but the largest collection of them is in Yellowstone National Park. These formations are also similar to hot springs, but they erupt. Name these formations, such as Old Faithful, that shoot water and steam into the air.</p>	<p><b>geysers</b> [prompt on <b>hot springs</b>]</p>
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### Question #4: Social Studies – World History

10 points

<p>Theodore Roosevelt used the indemnity money from this event to create a scholarship program. This event included the Siege of the International Legations, which was stopped by the Eight-Nation Alliance. Attacks during this event against <b>Dagu</b> [DAH-goo] forts by foreign ships led the Empress <b>Dowager Cixi</b> [DOW-uh-jer SEE-shee] to support the rebels. The rebels in this uprising used exercises that they believed made them immune to bullets; they targeted foreigners and local Christians and were known at first as the Righteous and Harmonious Fists. Name this 1900 uprising in Beijing.</p>	<p><b>Boxer</b> Rebellion [accept <b>Boxers</b> or <b>Boxer Uprising</b> or <b>Yihetuan</b>, accept <b>Righteous Harmony Movement</b> before “Righteous”; accept Society of <b>Righteous and Harmonious Fists</b> before mentioned]</p>
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**Question #5: Miscellaneous – Industrial Arts**

10 points

This material is not salt, but the Ancient Greek and Roman names for the Dead Sea stemmed from its abundance of this substance. In its most common application, the **Hveem [veem]** test is used to determine the maximum amount needed, and it is applied as the prime and tack coat. Used in the base of Japan lacquer, its mastic form has a higher binder content and is a popular waterproofing agent. The natural form of this substance is in the La **Brea [BRAY-uh]** Tar Pits. Name this black substance used in the manufacture of most roof shingles and to pave roads.

**asphalt** [accept **bitumen**;  
prompt on **tar** or **pavement**]

**Question #6: Science – Biology**

10 points

This organ's cells contain **intercalated [in-TER-kuh-lay-ted]** discs and form a **syncytium [sin-"SITE"-ee-um]**. The bundle of **His [rhymes with "geese"]** and **Purkinje [pur-KIN-jee]** fibers help provide conduction to this organ, relaying signals from the S.A. and A.V. nodes. This organ contains a pair of semilunar valves, as well as bicuspid and tricuspid valves. The **vena cava [VEE-nuh KAY-vuh]** leads into the right atrium of this organ. Its left **ventricle [VEN-trih-kul]** is the point of origin of the **aorta [ay-OR-tuh]**. Name this organ responsible for pumping blood throughout the body.

**heart** [accept **cardiac**  
muscle]



### Question #7: Mathematics – Trigonometry

10 points per part

The graph of the equation $x$ squared plus $y$ squared equals 1 is this specific shape.		
1	Name this figure used in trigonometry. The sine function gives the $y$ -coordinate of where the terminal side of an angle in standard position intersects this figure.	<b>unit circle</b> [prompt on <b>circle</b> ]
2	This is the quadrant on the unit circle where the sine and cosine functions are both <i>negative</i> .	<b>3rd</b>
3	The point on the unit circle corresponding to an angle of 240 degrees is located in the third quadrant. Give the value of the tangent of 240 degrees.	<b>root 3</b> [or <b>square root of 3</b> or <b>radical 3</b> , do not accept “3”, do not accept negative answers]

### Question #8: Mathematics – Trigonometry

10 points per part

In the equation of a sine or cosine graph, this value appears as a coefficient for the sine or cosine function.		
1	Name this quantity equal to half the vertical distance between the highest and lowest points on a graph.	<b>amplitude</b>
2	This term can refer to the horizontal distance taken up by one cycle of a graph, making it synonymous with “wavelength”. This term can also refer to the amount of time taken for one wave cycle.	<b>period</b>
3	Find the phase shift of the graph of $y$ equals 2, plus 3 times the cosine of the quantity, $4x$ minus 5, end quantity. Give the smallest possible positive answer.	<b>5/4</b> [or <b>1.25</b> or <b>1 + 1/4</b> ; accept additional information specifying that the shift is positive or to the right]



**Question #9: Social Studies – Current Events**

*10 points per part*

In this person’s two Senate election campaigns, he won the Democratic nomination, but declined the nomination.		
<b>1</b>	Name this independent senator from Vermont.	(Bernard) Bernie <b>Sanders</b>
<b>2</b>	During his 2016 presidential campaign, Sanders has said that he would not form one of these independent organizations that can raise unlimited funds.	<b>Super PACs</b> [or <b>super political action committees</b> ; do not prompt on “PAC(s)” or “political action committee(s)”]
<b>3</b>	On top of rejecting Super <b>PAC [pak]</b> funds, Sanders has also called for the reversal of the Supreme Court opinion in this case, which ruled that independent expenditures by corporations are protected speech under the First Amendment.	<b><i>Citizens United v. FEC</i></b> [or <b><i>Citizens United v. Federal Election Commission</i></b> ]

**Question #10: Social Studies – Current Events**

*10 points per part*

Pope Francis visited the U.S. in September 2015.		
<b>1</b>	Name the Ohio Republican who resigned as Speaker of the House the day after the Pope’s speech to Congress.	John Andrew <b>Boehner</b> <b>[BAY-nur]</b>
<b>2</b>	During his visit, Pope Francis canonized <b>Junipero Serra</b> [ <b>hoo-nee-PAIR-oh SAIR-ah</b> ] for his missionary work in this former Spanish colony, now a U.S. state.	<b>California</b>
<b>3</b>	Paul Gosar, a Republican from this state, boycotted the Pope’s speech because of the Pope’s position on climate change. This state is currently led by Doug Ducey, who succeeded Jan Brewer.	<b>Arizona</b>



**Question #11: Literature – World Literature**

10 points per part

This writer’s stint as his country’s ambassador to India inspired his poem “A Tale of Two Gardens”.		
<b>1</b>	Name this writer who talked about the <b>Tlatelolco</b> [t’lah-tay-LOHL-koh] massacre in his “Post data” speech, which was added to later versions of his essay compilation <i>The Labyrinth of Solitude</i> .	Octavio <b>Paz</b> (Lozano)
<b>2</b>	The massacre occurred in this country, which Paz was from.	<b>Mexico</b> [or United <b>Mexican States</b> or <b>Estados Unidos Mexicanos</b> ]
<b>3</b>	Paz’s circular poem “Sun Stone” was inspired by the circular calendar of this civilization, which used to control what is now Mexico City.	<b>Aztecs</b>

**Question #12: Literature – World Literature**

10 points per part

At this play’s conclusion, <b>Dubois</b> [doo-bwah] informs the protagonist that he lost a suit.		
<b>1</b>	Name this drama in which the protagonist indicates his desire to leave “an abyss where vice is triumphant” and seek out a place where “one may enjoy the freedom of being an honest man”.	<i>The <b>Misanthrope</b></i> (, or the <i>Cantankerous Lover</i> ) [or <i>Le <b>Misanthrope</b> (ou l’Atrabilaire amoureux)</i> ]
<b>2</b>	This author of <i>The Misanthrope</i> died onstage during a performance of his play <i>The Imaginary Invalid</i> .	<b>Molière</b> [or Jean-Baptiste <b>Poquelin</b> ]
<b>3</b>	In <i>The Misanthrope</i> , <b>Oronte’s</b> [aw-rahnt’s] lawsuit against <b>Alceste</b> [al-sest] stemmed from the latter’s insults directed at one of these 14-line poems written by Oronte.	<b>sonnets</b>



**Question #13: Science – Physics**

*10 points per part*

One of <b>Amontons'</b> [ah-man-taw'z] laws of this phenomenon states that it is independent of the area of contact.		
<b>1</b>	Name this force that opposes motion. In fluid mechanics, it is called drag.	<b>friction</b> (al force)
<b>2</b>	This friction, sometimes contrasted with kinetic friction, is the force that needs to be overcome to get an object to start moving.	<b>static</b> friction [or <b>stiction</b> ]
<b>3</b>	This French scientist's research into static and kinetic friction led to his model of friction, which states that the force of friction is less than or equal to the coefficient of friction times the normal force.	Charles-Augustin de <b>Coulomb</b> [koo-lawmb]

**Question #14: Science – Physics**

*10 points per part*

This quantity equals about 1.34 for water.		
<b>1</b>	Name this quantity, the ratio of the speed of light in a vacuum to the speed of light in a particular medium. Light bends when it travels between media with different values for this quantity.	<b>index of refraction</b> [or <b>refractive index</b> ; prompt on partial answers; prompt on <b><i>n</i></b> ]
<b>2</b>	The index of refraction is multiplied by the sine of the angle of incidence in this formula, named for a Dutch scientist.	<b>Snell's</b> law [or <b>Snellius'</b> law]
<b>3</b>	In a medium with a high index of refraction, it may be easier to observe this effect, in which a charged particle moves faster than light in its medium, emitting bluish radiation analogous to a sonic boom.	<b>Cherenkov</b> ["CHAIR"-en-kawff] radiation



### Question #15: Social Studies – Geography

10 points

The Pay-Khoy are a northern extension of this mountain range. This range's western slopes are drained by the Pechora basin. Its Nether-Polar section features its tallest peaks, including Mount Narodnaya [nah-RODE-nie-yah], which is south of the Kara [KAH-rah] Sea and drains eastward to the Ob River. The southern end of this range is near the Aral Sea, though much of the waters from it drain into the Caspian Sea. This range extends southward into Kazakhstan, and it is primarily located in Russia. Name this mountain range that divides Europe from Asia.

Ural Mountains or Urals [or Uralsky Khrebet]

### Question #16: Literature – World Literature

10 points

In one poem, this author describes Guido Cavalcanti [GEE-doh kah-vahl-KAHN-tee] as “the first of my friends.” The opening poem of that collection by this author describes it as a “book of memory”. This author of *La Vita Nuova* wrote a collection in which the narrator encounters God in the Empyrean [em-PEER-ee-un], and passes through a gate with the inscription “Abandon all hope, ye who enter here.” The narrator of that work is guided by Virgil and Beatrice. Name this author who described a journey from hell to purgatory and then heaven in *The Divine Comedy*.

Dante Alighieri [DAHN-tay ah-lee-gee-“AIR”-ee] [or Durante degli Alighieri; accept any underlined portion]





### Question #17: Fine Arts – Classical Music & Opera

10 points

Inspired by a revival of **Jean-Philippe Rameau's** [zhahn fih-leep rah-moh'z] music, this composer included an **homage** [AHM-uj] to Rameau after this composer's *Reflections in the Water* in his first set of *Images*. Another work by this composer was developed into a ballet by Vaslav Nijinsky and was based on a **Stéphane Mallarmé** [steh-fahn mah-lahr-may] poem. This composer also wrote a set of three symphonic sketches that included "Play of the Waves". Those pieces are *Prelude to the Afternoon of a Faun* and *La mer* [lah mair]. Name this French composer whose *Suite bergamasque* [ber-ga-mask] includes "Clair de **lune** [loon]".

**Claude(-Achille) Debussy**  
[kloh-d deb-yoo-see]

### Question #18: Science – Chemistry

10 points

The **van 't Hoff** [vawnt HAWFF] factor is the ratio of the actual and expected values of this quantity. Beer's law states that absorption is proportional to this quantity's product with path length and the extinction coefficient. Partial pressures can be used in place of this quantity when defining the equilibrium constant. **Colligative** [kah-LIG-uh-tiv] properties are proportional to a form of this quantity called **molality** [moh-LAAL-ih-tee]. Name this quantity describing how much of a compound has dissolved in a solution, which can be measured as molarity.

(molar) **concentration**  
[prompt on **molality** or  
**molarity** or **molar** before  
"molality"]



### Question #19: Social Studies – U.S. History

10 points

Herbert and Sue Hicks initially agreed to participate in this event, and H. G. Wells was approached as a leader for the opposing side by George **Rappleyea** [**RAP-ul-yay**]. Based on a text written by George William Hunter, H. L. Mencken called one person involved in this case a “Fundamentalist Pope”. Brought on by a violation of the Butler Act, this event attracted national attention to Dayton, Tennessee. This event is the subject of the play *Inherit the Wind*, and it pitted Clarence Darrow against William Jennings Bryan. Name this trial about the teaching of evolution.

**Scopes monkey** trial [accept either underlined part; accept *The State of Tennessee v. John Thomas Scopes*]

### Question #20: Literature – Mythology

10 points

This creature’s saliva formed the poisonous **aconite** [**AK-uh-“night”**] plant. The third and final time the king of **Tiryas** [**TIR-inz**] leapt into a wine jar, it was upon seeing this beast. In the *Aeneid* [**uh-NEE-id**], the **Cumaeen Sibyl** [**kyoo-MAY-un SIB-ul**] gave this creature a spiked cake. **Hesiod** [**HEH-see-ahd**] wrote of this creature having 50 heads, which may have counted the serpents in its mane. After charming **Charon** [**“CARE-on”**], **Orpheus** [**OR-fee-us**] was able to tame this monster. This creature guards the entrance to the underworld in Greek myth. Name this dog who is usually depicted with three heads.

**Cerberus** [accept **Kerberos**]



### Question #21: Fine Arts – Art History

10 points per part

The painter Daniele da Volterra tried to add clothing to this painting to cover figures' nakedness.		
<b>1</b>	Name this Michelangelo painting in which Jesus decides who rises and who falls.	The <b>Last Judgment</b> [or Il <b>Giudizio Universale</b> ]
<b>2</b>	This painter made a <b>triptych</b> [TRIP-tik] of <i>The Last Judgment</i> . He also made the triptych <i>The Garden of Earthly Delights</i> .	Hieronymus <b>Bosch</b> [or Jheronimus <b>van Aken</b> ]
<b>3</b>	<i>The Garden of Earthly Delights</i> hangs in this major art museum in Madrid.	Museo del <b>Prado</b> [or The <b>Prado</b> ]

### Question #22: Fine Arts – Art History

10 points per part

This was the main style of painting and architecture in western Europe during the 17th and early 18th centuries.		
<b>1</b>	Name this style dominant between the Mannerist and Rococo periods.	(early) <b>baroque</b> art
<b>2</b>	This Flemish baroque painter created <i>The Elevation of the Cross</i> and <i>The Descent from the Cross</i> .	Peter Paul <b>Rubens</b>
<b>3</b>	This Baroque artist designed the Cornaro Chapel and created the sculpture <i>Ecstasy of Saint Teresa</i> for it.	Gian Lorenzo <b>Bernini</b> [or Giovanni Lorenzo <b>Bernini</b> ]



### Question #23: Mathematics – Algebra

10 points per part

This technique can be used to change a quadratic function from standard form into vertex form.		
1	Name this process in which you add a constant so that a quadratic expression becomes a perfect square trinomial.	<b><u>completing the square</u></b> [accept word forms such as <b><u>complete the square</u></b> ]
2	What number should be added to $x$ squared plus twelve $x$ in order to complete the square?	<b><u>36</u></b>
3	What is the only solution to the equation $x$ squared plus twelve $x$ plus thirty-six equals zero?	$x = \underline{-6}$

### Question #24: Mathematics – Algebra

10 points per part

The graph of this function is half of a horizontal parabola.		
1	Name this function equivalent to raising a number to the one-half power.	(taking the) <b><u>square root</u></b> [accept variations like <b><u>square rooting</u></b> ; prompt on <b><u>radical</u></b> ]
2	Simplify the square root of 72 as much as possible, by taking as many powers as possible out of the radical.	<b><u>6 root 2</u></b> [or <b><u>6 times the square root of 2</u></b> or <b><u>6 radical 2</u></b> or equivalents]
3	Find the square root of the quantity two raised to the tenth power. Give your answer without using any exponents.	<b><u>32</u></b> [prompt on <b><u>two to the fifth</u></b> power]



**Question #25: Social Studies – U.S. History**

*10 points per part*

In one speech, this person described humanity “hanging from a cross of iron.”		
<b>1</b>	Name this president whose farewell address warned about the expansion of the military-industrial complex. He had been the Supreme Commander of the Allied Forces during World War II.	Dwight D(avid) (“Ike”) <b><u>Eisenhower</u></b>
<b>2</b>	In consecutive presidential elections, Eisenhower defeated this “egghead”. This person’s grandfather was Grover Cleveland’s vice president.	Adlai E(wing) <b><u>Stevenson II</u></b>
<b>3</b>	Near the end of Eisenhower’s presidency, Gary Powers was captured by the Soviet Union after flying one of these spy planes for the CIA.	Lockheed <b><u>U2</u></b> [prompt on <b><u>Dragon Lady</u></b> ]

**Question #26: Social Studies – U.S. History**

*10 points per part*

During his Presidential campaign, this person promised a “return to normalcy”.		
<b>1</b>	Name this president whose advisers were nicknamed “the Ohio Gang”. His short presidency was tainted by the Teapot Dome scandal.	Warren G(amaliel) <b><u>Harding</u></b>
<b>2</b>	This person was Harding’s Secretary of Commerce. He led the U.S. Food Administration during World War I and later ordered Douglas MacArthur to move against the Bonus Army when he became president.	Herbert (Clark) <b><u>Hoover</u></b>
<b>3</b>	Teapot Dome, which was leased to oil companies that bribed Secretary of the Interior Albert Bacon Fall, is in this state.	<b><u>Wyoming</u></b>



### Question #27: Literature – British Literature

10 points per part

Henry Sweet was the inspiration for this fictional linguist.		
1	Name this phonetics professor who created a “Universal Alphabet” that was read by the author of “Spoken Sanskrit,” Colonel Pickering.	Professor Henry <b>Higgins</b> [prompt on <b>Henry</b> ]
2	Henry Higgins wagered Colonel Pickering that he could get this Cockney girl to pass among nobility.	<b>Eliza Doolittle</b> [accept either]
3	This Irish playwright wrote about Henry Higgins’ attempts to train Eliza Doolittle in <i>Pygmalion</i> . This playwright also wrote <i>Major Barbara</i> and <i>Saint Joan</i> .	George Bernard <b>Shaw</b>

### Question #28: Literature – British Literature

10 points per part

One sergeant compared the havoc wreaked by this man and the title character to the Battle of <b>Golgotha</b> [ <b>GAHL-guh-thuh</b> ].		
1	Name this character who was told by a witch that he would not be a king, but would beget a line of them. Three murderers do him in, but his son <b>Fleance</b> [ <b>FLAY-unss</b> ] escaped the attack.	(Lord) <b>Banquo</b>
2	Banquo’s murder was ordered by this <b>thane</b> [ <b>rhymes with “train”</b> ], the title character of a Shakespeare play. He also killed King Duncan, but Macduff ended up taking this man’s head.	<b>Macbeth</b>
3	After Macbeth dies, this heir of Duncan becomes king. His forces approached Macbeth’s castle using plants from Birnam Wood as a disguise.	<b>Malcolm</b>



### Question #29: Science – Physics

10 points

Three of these objects with known strengths can be used to find the strength of an unknown fourth one by assembling them into a Wheatstone bridge. Capacitors and these devices are usually labeled with colored bands to indicate their strength, which can be calculated as the voltage across them divided by the current passing through them. They are represented by a zig-zag on a circuit diagram. Name these circuit components that oppose the flow of current and that are governed by Ohm's law.

resistors [prompt on  
resistance]

### Question #30: Social Studies – World History

10 points

The founder of Metaxim led a coup in this country that established its "Third Civilization". King Constantine's dismissal of this country's prime minister in the Apostasy Crisis was followed by the Regime of the Colonels. Ottoman troops murdered thousands of revolting citizens here during the **Chios** [KEE-ohss] Massacre. This country and Turkey were supported by the Truman Doctrine. This country has recently been headed by the **Syriza** [seer-EEZ-uh] Party's Alexis **Tsipras** [SEE-pruss]. Name this European country whose legislature is called the **Hellenic** [heh-LEH-nik] Parliament, and which is governed from Athens.

Greece [before "Hellenic",  
accept **Hellenic Republic** or  
**Ellas** or **Ellada** or **Elliniki**  
Dhimokratia]



**Question #31: Literature – U.S. Literature**

10 points

In one story by this writer, men are only allowed to think about women during the Time of Mating, and people's jobs are selected by the Council of Vocations. This author wrote of an unseen character that saw towers shining on the bottom of the ocean, and subsequently sank his ship. This author created a character who built a motor powered by atmospheric static electricity, John Galt. This founder of Objectivism wrote of textbook writer Ellsworth Toohey, who sought to undermine architect Howard Roark. Name this author of *Anthem*, *Atlas Shrugged*, and *The Fountainhead*.

**Ayn** [rhymes with "mine"]  
**Rand** [or Alisa Zinovyevna  
**Rosenbaum**]

**Question #32: Mathematics – Math Concepts**

10 points

One example of this kind of shape is formed by extending lines drawn through adjacent points that trisect the sides of a quadrilateral, and is named for Ferdinand Wittenbauer. Similarly, connecting the adjacent midpoints of any quadrilateral produces one of these shapes. This is the most general quadrilateral whose diagonals divide it into congruent triangles. Its area can be found by treating adjacent sides as vectors and finding the magnitude of the cross product. If its sides are all equal in length, this shape is a rhombus. This shape's adjacent angles are supplementary. If its angles are right angles, this shape is a rectangle. Name this shape whose opposite sides are congruent and parallel.

**parallelogram** [prompt on  
**quadrilateral** or  
**quadrangle** before  
"quadrilateral"]





### Extra Question #1: Fine Arts – Art History

10 points

<p>A yellow arc goes around much of this painter's <i>Shimmering Substance</i>, which was created soon after he and his wife bought a barn on Long Island. What appears to be a black gash runs nearly top to bottom of this painter's mostly white work titled <i>The Deep</i>. One of his works got its nickname from eight blue lines running nearly top to bottom. That painting is known as either <i>Blue Poles</i> or <i>Number Eleven, 1952</i>. He was married to the artist Lee Krasner until he died from driving under the influence. Name this abstract expressionist famous for his drip paintings.</p>	<p>(Paul) Jackson <b>Pollock</b> [accept <i>Shimmering Substance</i> before "painter's"]</p>
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### Extra Question #2: Social Studies – U.S. History

10 points

<p>The Blount Report was commissioned after an uprising in this territory, while the Newlands Resolution allowed for its annexation. It was home to a colony founded by Father <b>Demian</b> [DAY-mee-un], and an attempt to do away with this state's Bayonet Constitution was followed by a <b>coup</b> [koo] led by Sanford Dole. It was a kingdom ruled by <b>Kamekameha</b> [kah-MAY-kah-MAY-hah] and <b>Liliuokalani</b> [LIL-ee-oo-oh-kuh-LAH-nee] before the U.S. annexed it. Barack Obama was born in this state. Name this state in the middle of the Pacific Ocean.</p>	<p><b>Hawai'i</b></p>
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### Extra Question #3: Mathematics – Math Concepts

10 points

<p>If the first two terms of a strictly monotone sequence are five and ten, then the entire sequence must have this property. If the first derivative of a function has this property, then the function is concave up. If a differentiable function has this property, then its first derivative is positive. If a function <math>f</math> has this property and <math>A</math> is less than <math>B</math>, then <math>f</math> of <math>A</math> must be less than <math>f</math> of <math>B</math>. An arithmetic sequence has this property if the common difference is positive. Name this property of functions or sequences whose graphs go upward.</p>	<p><b>increasing</b> [accept word forms]</p>
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### Extra Question #4: Science – Physics

10 points

<p>Imperfections in these structures can be due to vacancies or occupation of <b>interstitial</b> [“inter”-STIH-shul] sites. The orientation of these structures can be described using Miller <b>indices</b> [IN-duh-sees]. These structures are formed in a purification method in which a compound is dissolved in solution, and then the solution is cooled. The pattern light makes after interacting with one of these structures can be modeled with Bragg’s law. These structures are defined by a repeating unit cell. Name these lattice structures that consist of ordered arrangements of atoms, examples of which include quartz and diamond.</p>	<p><b>crystals</b> [prompt on <b>lattices</b>; accept <b>crystal</b> lattices]</p>
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**Extra Question #5: Literature – U.S. Literature**

*10 points*

Among the locations seen by the speaker in this poem are a school where children “strove” at recess, and fields of grazing grain. After being passed by the setting sun in this poem, the speaker felt a chill on account of her tulle [“tool”] tippet and gossamer gown. At the end of this poem, the narrator surmises that the “horses’ heads were toward eternity.” The speaker of this poem had put away labor and leisure for the civility of the title figure, who was accompanied by immortality. Name this poem by Emily Dickinson in which a figure “stopped for her”.

**“Because I Could not Stop  
for Death”** [accept answers  
mentioning **712**]



**Extra Question #6: Science – Biology**

*10 points per part*

This reactive oxygen species in the body is broken down by <b>catalase</b> [KAA-tuh-“lace”].		
<b>1</b>	Name this <b>cation</b> [“cat-eye-on”] whose formula is $O_2^{2-}$ [“O two, two minus”], and which is also found in the compound $H_2O_2$ [“H two O two”].	<b><u>peroxide</u></b> [accept <b><u>hydrogen peroxide</u></b> ]
<b>2</b>	Another reactive oxygen species is this ion with formula $O_2^{1-}$ [“O two, one minus”], which is broken down by a namesake <b>dismutase</b> [dis-myoo-TASE] into peroxide and oxygen.	<b><u>superoxide</u></b>
<b>3</b>	A mutation in the superoxide dismutase gene <b>SOD1</b> [sahd “one”] is common in patients with this neuron-killing disease sometimes named for a baseball player.	<b><u>amyotrophic lateral sclerosis</u></b> [or <b><u>ALS</u></b> ; or <b><u>Lou Gehrig’s disease</u></b> ]

**Extra Question #7: Science – Biology**

*10 points per part*

Proteins enter this organelle through the “TOM” and “TIM” complexes.		
<b>1</b>	Name this organelle, famously described “the powerhouse of the cell”.	<b><u>mitochondrion</u></b> [or <b><u>mitochondria</u></b> ]
<b>2</b>	Lynn Margulis proposed this theory that suggests the mitochondrion originated as a separate <b>microbe</b> [“MIKE-robe”] that was “swallowed” by another cell.	<b><u>endosymbiotic</u></b> [EN-doh-SIM-by-AH-tik] theory or <b><u>endosymbiosis</u></b> [EN-doh-SIM-by-OH-sis] [or <b><u>symbiogenesis</u></b> ]
<b>3</b>	The endosymbiotic theory is supported by the fact that the mitochondria has its own genome, which is passed down through these people.	<b><u>mothers</u></b> [accept <b><u>matrilineally</u></b> or <b><u>maternally</u></b> or similar variations; accept <b><u>females</u></b> or <b><u>women</u></b> ]



**Extra Question #8: Literature – U.S. Literature**

*10 points per part*

The central figure of this poem cannot hear the bugle trills or see the bouquets and ribbon wreaths, for he has “fallen cold and dead”.		
<b>1</b>	Name this poem whose speaker walks “with mournful tread” even though “the prize we sought was won.”	<b>“O Captain! My Captain!”</b>
<b>2</b>	“O Captain! My Captain!” was published in later editions of this poet’s collection <i>Leaves of Grass</i> .	Walt(er) <b>Whitman</b>
<b>3</b>	This Whitman poem, another elegy to Abraham Lincoln, features a gray-brown bird singing a carol that describes death as “lovely and soothing”.	<b>“When Lilacs Last in the Dooryard Bloom’d”</b>

**Extra Question #9: Literature – U.S. Literature**

*10 points per part*

It may “stink like rotten meat / or crust and sugar over — like a syrupy sweet”.		
<b>1</b>	Name this abstract concept, the subject of the poem “Harlem”, which might “just sag, like a heavy load”.	a <b>dream deferred</b> [prompt on <b>dream</b> ]
<b>2</b>	This author of “Harlem” described bodies of water “ancient as the world and older than the flow of blood in human veins” in the poem “The Negro Speaks of Rivers.”	(James Mercer) Langston <b>Hughes</b>
<b>3</b>	The opening stanza of “Harlem” inquires as to whether a dream deferred dries up like this object. Lorraine Hansberry titled her drama about the Younger family after this item.	a <b>raisin</b> in the sun